

| [NODIS Library](#) | [Program Management\(8000s\)](#) | [Search](#) |



NASA Procedural Requirements

COMPLIANCE IS MANDATORY

NPR 8570.1

Effective Date: March 15,

2001

Expiration Date: March 15,

2007

[Printable Format \(PDF\)](#)

Subject: Energy Efficiency and Water Conservation w/Change 1 (3/30/04)

Responsible Office: Environmental Management Division

| [TOC](#) | [Change History](#) | [Preface](#) | [Chp1](#) | [Chp2](#) | [Chp3](#) | [Chp4](#) | [Chp5](#) | [Chp6](#) | [Chp7](#) | [Chp8](#) |
[Chp9](#) | [Chp10](#) | [AppdxA](#) | [AppdxB](#) | [AppdxC](#) | [AppdxD](#) | [AppdxE](#) | [AppdxF](#) | [AppdxG](#) | [AppdxH](#) |
[AppdxI](#) | [AppdxJ](#) | [AppdxK](#) | [AppdxL](#) | [AppdxM](#) | [AppdxN](#) | [AppdxO](#) | [AppdxP](#) | [AppdxQ](#) | [AppdxR](#) |
[AppdxS](#) | [AppdxT](#) | [AppdxU](#) | [AppdxV](#) | [AppdxW](#) | [AppdxX](#) | [AppdxY](#) | [ALL](#) |

Appendix H: Federal Life-Cycle Costing Procedures and Supporting Software

H.1 Federal agencies are required to evaluate energy-related investments on the basis of minimum life-cycle costs (10 CFR Part 436). A life-cycle cost evaluation computes the total long-run costs of a number of potential actions, and selects the action that minimizes the long-run costs. When considering retrofits, sticking with the existing equipment is one potential action, often called the baseline condition. The life-cycle cost (LCC) of a potential investment is the present value of all of the costs associated with the investment overtime.

H.2 The first step in calculating the LCC is the identification of the costs. Installed Cost includes cost of materials purchased and the labor required to install them (for example, the price of an energy-efficient lighting fixture, plus cost of labor to install it). Energy Cost includes annual expenditures on energy to operate equipment. (For example, a lighting fixture that draws 100 watts and operates 2,000 hours annually requires 200,000 watt-hours (200 kWh) annually. At an electricity price of \$0.10 per kWh, this fixture has an annual energy cost of \$20.) Nonfuel O&M includes annual expenditures on parts and activities required to operate equipment (for example, replacing burned out light bulbs). Replacement Costs include expenditures to replace equipment upon failure (for example, replacing an oil furnace when it is no longer usable).

H.3 Because LCC includes the cost of money, periodic and a periodic maintenance (O&M) and equipment replacement costs, energy escalation rates, and salvage value, it is usually expressed as a present value, which is evaluated by

$$\text{LCC} = \text{PV(IC)} + \text{PV(EC)} + \text{PV(OM)} + \text{PV(REP)}$$

where	PV(x) denotes "present value of cost stream x," IC is the installed cost, EC is the annual energy cost, OM is the annual nonenergy O&M cost, and REP is the future replacement cost.
-------	--

H.4 Net present value (NPV) is the difference between the LCCs of two investment alternatives, e.g., the LCC of an energy-saving or energy cost-reducing alternative and the LCC of the existing, or baseline, equipment. If the alternative's LCC is less than the baseline's LCC, the alternative is said to have a positive NPV, i.e., it is cost-effective. NPV is thus given by

$$\text{NPV} = \text{PV(EC0)} - \text{PV(EC1)} + \text{PV(OM0)} - \text{PV(OM1)} + \text{PV(REP0)} - \text{PV(REP1)} - \text{PV(IC)} \text{ or } \text{NPV} = \text{PV(ECS)} + \text{PV(OMS)} + \text{PV(REPS)} - \text{PV(IC)}$$

where

subscript 0 denotes the existing or baseline condition, subscript 1 denotes the energy cost saving measure, IC is the installation cost of the alternative (note that the IC of the baseline is assumed zero), ECS is the annual energy cost savings, OMS is the annual nonenergy O&M savings, and REPS is the future replacement savings.

H.5 Levelized energy cost (LEC) is the breakeven energy price (blended) at which a conservation, efficiency, renewable, or fuel-switching measure becomes cost-effective ($\text{NPV} \geq 0$). Thus, a project's LEC is given by

$$\text{LEC} = (\text{PV(OMS)} + \text{PV(REPS)} - \text{PV(IC)})/\text{EUS}$$

where

EUS is the annual energy use savings (energy units/yr). Savings-to-investment ratio (SIR) is the total (PV) savings of a measure divided by its installation cost:

$$\text{SIR} = (\text{PV(ECS)} + \text{PV(OMS)} + \text{PV(REPS)})/\text{PV(IC)}.$$

H.6 Some of the tedious effort of life-cycle cost calculations can be avoided by using the Building Life-Cycle Cost software, BLCC, developed by NIST. For copies of BLCC, call the FEMP Help Desk at (800) 566-2877.

H.7 Centers can obtain the ECONPACK for Windows software from a CD-ROM program distributed through the National Institute of Building Sciences (NIBS), Construction Criteria Base (CCB), and available through the Center's NASA SPECSINTACT construction specifications manager. The software can be used for 30 days if arrangements are made to "unlock" the software by contacting the developer at the following address:

U.S. Army Corps of Engineers
Engineering and Support Center, Huntsville (ECONPACK)
P.O. Box 1600
Huntsville, AL 35807-4301
Telephone No.: (256) 895-1838

Centers can also obtain additional information on the ECONPACK Program and download the latest version of the software from the U.S. Army Corps of Engineers Military Program (CEMP) Web site at:
<http://www.hq.usace.army.mil/cemp/e/ec/econ.htm>

| [NODIS Library](#) | [Program Management\(8000s\)](#) | [Search](#) |

DISTRIBUTION:
NODIS

This Document Is Uncontrolled When Printed.

Check the NASA Online Directives Information System (NODIS) Library
to Verify that this is the correct version before use: <http://nodis3.gsfc.nasa.gov>
